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Sr-Nd isotope geology and tectonomagmatic setting of the Dehsalm intrusives (Lut Block, Eastern Iran)

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The Dehsalm porphyritic shallow intrusives belong to the Lut Block volcanic-plutonic belt (central eastern Iran). Previous research on alteration, mineralization and hydrothermal fluids indicates that a Cu-Mo porphyry type mineralization system is related with these intrusives (Arjmandzadeh et al., 2012). The rocks studied in this work range in composition from gabbro-diorite to granite, with dominance of monzonites and quartz monzonites, and have geochemical features of high-K calc alkaline to shoshonitic volcanic arc suites. The trends of major element oxides on Harker diagrams, together with textural evidence, point to the crystal fractionation of clinopyroxene, Ca – plagioclase, hornblende, apatite and oxide minerals. Primitive mantle - normalized trace element spider diagrams display strong enrichment in LILE, such as Rb, Ba and Cs, and depletions in some high field strength elements (HFSE), such as Nb, Ti, Y and HREE. Chondrite-normalized plots show significant LREE enrichments, high LaN/YbN (21.5 to 31.0) and the lack of Eu anomaly. Sr/Y and La/Yb ratios of Dehsalm intrusives are respectively 31.6-72.2 and 21.5-33.5, which reveals that, despite their K-rich composition, these rocks also have some adakitic affinity.

A Rb-Sr whole rock-feldspar-biotite age of 33.4$\pm$1 Ma was obtained in a quartz monzonite sample; this date may be interpreted as close to the intrusion age, considering that the chosen sample is almost unaltered and should have suffered fast cooling. The obtained age coincides, within error, with a previous geochronological result in a similar rock from the Chah-Shaljami area (Arjmandzadeh et al., 2011), further northwest along the eastern border of the Lut Block.

87Sr/86Sr(33Ma) and εNd(33Ma) values range from 0.70481 to 0.70508 and from +1.5 to +2.5, respectively, which fits into a supra-subduction mantle wedge source for the parental melts and indicates that crustal contribution for magma diversification was not relevant. Sr and Nd isotope compositions together with major and trace element geochemistry point to the origin of the parental magmas by melting of a metasomatized mantle source, with garnet behaving as a residual phase, whilst phlogopite was an important contributor to the generated melts.

Both geochemical features of Dehsalm porphyries and its association with Cu-Mo mineralization agree with a mature continental arc setting related to the convergence of Afghan and Lut plates during Oligocene. The data on the Dehsalm granitoids reveal a strong affinity with the contemporary rocks from Chah-Shaljami, studied in a previous work (Arjmandzadeh et al., 2011). Moreover, the wider range of compositions (including more mafic compositions) at Dehsalm provides additional support for the suggestion that parental magmas have a mantle origin.

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